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Recent slope failures in the Dolomites (Northeastern Italian Alps) in a context of climate change / Chiarle, Marta; Paranunzio, Roberta; Laio, Francesco; Guido, Nigrelli; Fausto, Guzzetti. - In: GEOPHYSICAL RESEARCH ABSTRACTS. - ISSN 1607-7962. - 16:(2014). (Intervento presentato al convegno EGU General Assembly 2014 tenutosi a Vienna nel 27 April – 2 May 2014).

Availability:

This version is available at: 11583/2655919 since: 2016-11-15T11:54:24Z

Publisher:

Published

DOI:

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Recent slope failures in the Dolomites (Northeastern Italian Alps) in a context of climate change

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Climate change in the Greater Alpine Region is seriously affecting permafrost distribution, with relevant consequences on slope stability. In the Italian Alps, the number of failures from rockwalls at high elevation markedly increased in the last 20-30 years: the consistent temperature increase, which warmed twice than the global average, may have seriously influenced slope stability, in terms of glaciers retreat and permafrost degradation. Moreover, the growing number of tourists and activities in alpine regions (in particular in the Dolomites) made these areas particularly critical in relation to natural hazards. In this light, an integrated short-term geomorphological and climatic analysis was performed, in order to better comprehend the impact of main climate elements (especially temperature and precipitation) on slope failures in high mountain areas.

In this contribution, we focus on three recent slope failures occurred at high elevation sites in the Dolomites (Northeastern Italian Alps), declared a UNESCO World Heritage Site in August 2009. We describe here three important rock falls occurred in the autumn 2013: 1) the Sorapiss rock fall, on 30 September 2013; 2) the Monte Civetta rock fall, on 16 November 2013; 3) the Monte Antelao rock fall, on 22 November 2013. The Monte Civetta rock fall damaged some climbing routes, while the other two landslides did not cause any damage or injury. Despite the limited volume involved, these three events represent an important warning sign in the context of ongoing climate change.

Geomorphological information about the rock fall sites were combined with the climatic data acquired from the meteorological stations surrounding the slope failure areas. A short-term climatic analysis was performed, with the aim of understanding the role of the main climatic elements in the triggering of natural instability events in this area and in the Alps in general.